

Reads input files broadcasts, and allocates/initializes global variables.

[called by: [focus](#), [globals](#).]

[calls: .]

## Input namelist

The *focus* namelist is the only input namelist needed for FOCUS running. It should be written from the file *example.input*. Here are the details for the variables.

- **IsQuiet = -1**  
*Information displayed to the user*  
 -2: more details & update unconstrained cost functions;  
 -1: more details;  
 0: essential;  
 1: concise.
- **IsSymmetric = 0**  
*Enforce stellarator symmetry or not*  
 0: no stellarator symmetry enforced;  
 1: plasma periodicity enforced;  
 2: coil and plasma periodicity enforced.
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- **case\_surface = 0**  
*Specify the input plasma boundary format*  
 0: general VMEC-like format (Rbc, Rbs, Zbc, Zbs), seen in [rdsurf](#);  
 1: read axis for knots, seen in [rdknot](#); (not ready)
- **knotsurf = 0.2**  
*Minor plasma radius for knototrans, only valid for case\_surface = 1*
- **ellipticity = 0.0**  
*Ellipticity of plasma for knototrans, only valid for case\_surface = 1*
- **Nteta = 64**  
*Poloidal resolution for discretizing the plasma*
- **Nzeta = 64**  
*Toroidal resolution for discretizing the plasma*
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- **case\_init = 0**  
*Specify the initializing method for coils, seen in [rdcoils](#)*  
 -1: read the standard *coils.example* file;  
 0: read FOCUS format data in *example.focus*;  
 1: toroidally spaced **Ncoils** circular coils with radius of **init\_radius**;
- **case\_coils = 1**  
*Specify representation used for the initial coils, seen in [rdcoils](#)*  
 0: using piecewise linear representation; (not ready)  
 1: using Fourier series representation;
- **Ncoils = 0**  
*Number of coils initilized, only valid for case\_init = 1*
- **init\_current = 1.0E6**  
*Initial coil current (A), only valid for case\_init = 1*
- **init\_radius = 1.0**  
*Initial coil radius (m), only valid for case\_init = 1*
- **IsVaryCurrent = 1**  
*Keep coil currents fixed or not, overridden by example.focus*  
 0: coil currents are fixed;  
 1: coil currents are free;
- **IsVaryGeometry = 1**  
*Keep coil geometries fixed or not, overridden by example.focus*  
 0: coil geometries are fixed;  
 1: coil geometries are free;

- **NFcoil = 4**  
Number of Fourier coefficients for coils, only valid for **case\_coils = 1**, overridden by **example.focus**
- **Nseg = 128**  
Number of segments for discretizing coils, only valid for **case\_coils = 1**, overridden by **example.focus**
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- **IsNormalize = 1**  
Normalizing coil parameters or not  
0: keep raw data (normalized to 1.0);  
1: currents being normalized to averaged absolute current, coil geometry parameters being normalized to major radius;
- **IsNormWeight = 1**  
each constraints normalized to initial value or not  
0: keep raw value for constraints;  
1:  $w = w/f_0$  weights normalized to the initial values of each constraints;
- **case\_bnormal = 0**  
 $B_n$  error normalized to  $|B|$  or not  
0: keep raw  $B_n$  error;  
1:  $B_n$  residue normalized to local  $|B|$ ;
- **case\_length = 0**  
options for constructing coil length constraint, seen in [length](#)  
1: quadratic format, converging the target\_length;  
2: exponential format, as short as possible;
- **weight\_bnorm = 1.0**  
weight for  $B_n$  error, if zero, turned off; seen in [bnormal](#)
- **weight\_bharm = 0.0**  
weight for  $B_n$  Fourier harmonics error, if zero, turned off; seen in [bmnharm](#)
- **weight\_tflux = 0.0**  
weight for toroidal flux error, if zero, turned off; seen in [torflux](#)
- **target\_tflux = 0.0**  
target value for the toroidal flux, if zero, automatically set to initial  $\Psi_{ave}$ ; seen in [solvers](#)
- **weight\_ttlen = 0.0**  
weight for coils length error, if zero, turned off; seen in [length](#)
- **target\_length = 0.0**  
target value (or for normalization) of the coils length, if zero, automatically set to initial actual length; seen in [rdcoils](#)
- **weight\_specw = 0.0**  
weight for spectral condensation error, if zero, turned off; seen in [specwid](#); (not ready)
- **weight\_ccsep = 0.0**  
weight for coil-coil separation constraint, if zero, turned off; seen in [coilsep](#); (not ready)
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- **case\_optimize = 1**  
specify optimizing options.  
-2: check the 2nd derivatives; seen in [fdcheck](#); (not ready)  
-1: check the 1st derivatives; seen in [fdcheck](#);  
0: no optimizations performed;  
1: optimizing with algorithms using the gradient (DF and/or CG); seen in [solvers](#);  
2: optimizing with algorithms using the Hessian (HT and/or NT); seen in [solvers](#); (not ready)
- **DF\_maxiter = 0**  
maximum iterations allowed for using Differential Flow (DF); if zero, turned of; seen in [descent](#)
- **DF\_xtol = 1.000D-08**  
relative error for ODE solver; seen in [descent](#)
- **DF\_tauSta = 0.000D+00**  
starting value of  $\tau$ ; usually 0.0 is a good idea; seen in [descent](#)
- **DF\_tauend = 0.000D+00**  
ending value of  $\tau$ ; the larger value of  $\tau_{end} - \tau_{sta}$ , the more optimized; seen in [descent](#)
- **CG\_maxiter = 0**  
maximum iterations allowed for using Conjugate Gradient (CG); if zero, turned of; seen in [congrad](#)
- **CG\_xtol = 1.000D-08**  
the stopping criteria of finding minimum; if  $|d\chi^2/d\mathbf{X}| < CG\_xtol$ , exit the optimization; seen in [congrad](#);

- **CG\_wolfe\_c1 = 1.000D-04**  
*c1 value in the strong wolfe condition for line search; usually  $1.0 \times 10^{-4}$ ; seen in [congrad](#);*
  - **CG\_wolfe\_c2 = 0.1**  
*c2 value in the strong wolfe condition for line search; if one CG step takes too long, try to increase c2, but remember  $0 < c1 < c2 < 1$ ; seen in [congrad](#);*
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- **case\_postproc = 1**  
*specify post-processing options.*
    - 0: no extra post-processing;
    - 1: evaluate the present coils for each cost functions, coil curvature, coil-coil separation, and coil-plasma separation;
    - 2: write mgrid file; (not ready)
  - **save\_freq = 1**  
*frequency for writing output files; should be positive; seen in [solvers](#);*
  - **save\_coils = 0**  
*flag for indicating whether write example.focus and example.coils; seen in [saving](#);*
  - **save\_harmonics = 0**  
*flag for indicating whether write example.harmonics; seen in [saving](#);*
  - **save\_filaments = 0**  
*flag for indicating whether write .example.filaments.xxxxxx; seen in [saving](#);*